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ORIGINAL ARTICLE

Fine-needle Aspiration Cytology Thyroid: Cytohistological Correlation of 76 Patients

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ABSTRACT

Background: Surgical excision of all thyroid nodules would result in a large number of unnecessary procedures. Fine needle aspiration cytology is safe and minimally invasive OPD procedure for the pre-operative assessment of patients with thyroid nodules. The purpose of our study was to assess the diagnostic significance of FNAC and its applicability in order to detect which patients need just follow-up and who need surgical intervention.

Methods: A prospective cross sectional study was conducted on 76 patients with thyroid lesions at Surgical oncology unit in department of General surgery, Zagazig university hospital in the period from December 2019 to May 2020. Patients, who had FNAC, underwent surgery and histopathological results were recruited in the study.

Results: In this study, benign thyroid lesions were the commonest lesion detected in 58 patients (76.2%). Out of all benign lesions, Multinodular goiter (56.5%) was the most common. Thyroid lesions showed female preponderance, with 88.2 % females and 11.8 % males and a male: female ratio of 1:7.5. The sensitivity, specificity, and diagnostic accuracy of FNAC were 83.33%, 100 %, and 76.5 %, respectively.

Conclusion: Fine needle aspiration cytology (FNAC) is a simple and safe procedure that devoid of any serious complications. It is a sensitive, specific, and accurate initial diagnostic test for the preoperative evaluation of patients with thyroid swellings.

Key words: Fine needle aspiration cytology; Thyroid swelling.

INTRODUCTION

Thyroid nodules are a common clinical issue present in adult general population. The prevalence range of thyroid nodule is 4–10% in the adult and 0.2–1.2% in children. The most clinically diagnosed thyroid nodules are benign; 5–30% is malignant and requires surgical intervention [1].

It is more common in women, and the incidence increases with age, history of radiation exposure and a diet containing goitrogenic material. The clinical significance of thyroid nodules is the risk of malignancy. For a clinician, exclusion of malignancy is a necessity for cases with thyroid nodules [2]. Thyroid operations can be associated with lifelong thyroid hormone dependence and hypoparathyroidism in addition to the immediate operative risks involved. If an accurate preoperative diagnosis can be made, unnecessary surgery can be avoided in benign conditions [3]. Therefore, an effective screening test is needed to identify those who need surgery, and this has been achieved by fine needle aspiration cytology (FNAC) [1].Fine needle aspiration cytology (FNAC) is a simple and safe procedure and devoid of any serious complications. It can be carried out in the outpatient department or in the laboratory with minimum equipment. It does not require any anaesthesia, has a good patient compliance and results can be known quickly within one hour [4]. Since 1986, when fine needle aspiration cytology (FNAC) was first reported from Sweden, it has been widely accepted as the most accurate, cost-effective, and safe screening test for rapid diagnosis of thyroid nodules [5,6]. The aim of the current study was assessment of the diagnostic significance of FNAC and its applicability to detect which patients need follow-up and who need surgical intervention.

METHODS

After approval was taken from the ethical clearance committee and verbal consent was taken from all the patients after explanation of the benefits and possible risks of the study, the study was conducted. A prospective cross sectional study was conducted at surgical oncology unit in department of General surgery, Zagazig university hospital

during the period from December 2019 to May 2020. The study included 76 patients with thyroid lesions. 9 (11.8%) males and 67 (88.2%) (M: F, 1:7.5) females their age was range from (30 to 78 years) with mean age 50.5 ±11.41 years, who had FNAC, underwent surgery and histopathological results. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsiniki) for studies involving humans.

Inclusion criteria: True solitary thyroid nodule. Dominant thyroid nodule (if it is multinodular goiter).

Exclusion criteria: Patients who are unfit for surgery and who refused surgery in addition to patients less than 16 years old and Multinodular goiter without dominant nodule were excluded from the study.

All patients were subjected to demographic data taking, complete clinical examination, Laboratory investigations included Thyroid Function Tests (TFT): T3, T4 and TSH, Complete Blood Count (CBC), Liver Function Tests (LFTs), Kidney function tests [urea, electrolytes (Na, K and Cl) and creatinine), Chest radiography, ECG and Bleeding profile.

Preoperative investigations: Fine Needle Aspiration Cytology (FNAC) was performed and reported by a pathologist. A palpable mass was aspirated using a 22 or 23G needle attached to a 10cc syringe held in a syringe holder (gun). The smears were made on three glass slides which were immediately fixed in 95% ether in alcohol for at least half an hour. The smears were then stained by a standard papanicolau stain, mounted and cover-slipped ready for reporting. No anesthesia was required. Cases were classified into 4 main categories. **Benign lesion;** Specimens that were categorized as benign/negative for neoplasia included specimens with abundant colloid, variable numbers of unremarkable follicular cells in flat sheets; fluid containing various numbers of macrophages, colloid, and small, uniform follicular cells. **Follicular lesion;** This category applied to cellular specimens with scant or absent colloid and follicular cells, 3-dimensional clusters, and isolated, intact, individual cells. FN nuclei generally were overlapping, enlarged and round. **Suspicious for malignancy;** Most specimens in this category had some atypical cytologic features suggestive of, but not diagnostic for, malignancy, such as enlarged, atypical nuclei. **Malignancy;** specimens that had cytological features consistent with malignant neoplasms, including PCT, medullary carcinoma, anaplastic carcinoma, lymphoma, and metastatic cancers, were classified as positive for malignancy.

Postoperative Histopathology: All 76 patients underwent thyroid total thyroidectomy because some patients were diagnosed as malignant lesion and other patients have compression symptoms.

Final histopathology was then compared with initial FNA results. The Histopathology tissue findings were taken as the gold standard and the results of fine needle aspiration which was matching with the histopathology, taken as positive cases.

STATISTICAL ANALYSIS

Analysis was done by Statistical package for social Sciences version 20.0. Diagnostic value of the Fine Needle Aspiration Cytology was checked by calculating the sensitivity, specificity, positive predictive value, negative predictive value and by calculating the percentage of false positive and false negative results.

Sensitivity = T.P x 100 / T.P + F.N => 15 x 100 / 15+3 = 83.33 %.

Specificity = T.N x 100 / T.N+F.P => 58 x 100 / 58 + 0 = 100 %.

Positive Predictive Value (PVP) = T.P x 100 / Total positive test on FNAC (T+)

=> 15 x 100 / 15 + 0 = 100 %.

Negative Predictive Value (NVP) = T.N x 100/ Total Negative test on FNAC (T+)
=> 58 x 100 / 61 = 95.08 %.

Accuracy = (T.P + T.N) x 100 / T.P + F.P + T.N + F.N => (15 + 58) x 100 / 15 + 0 + 58 + 3 = 76.5 %.

RESULTS

A total of 76 patients with thyroid lesions were enrolled in the study. The mean age of the study participants was 50.55 ±11.41 years. Large percentage (39.5%) of the thyroid patients were in the 50-58 years age group. About 9 (11.8%) were male and 67 (88.2%) were female (M: F, 1:7.5). The main presenting symptom was painless neck swelling for less than one year nearly in all patients. Family history was also irrelevant in all cases. Table 1 In most of the cases (97.3%) thyroid swelling was in the midline of the neck and soft in consistency (98.7%). The largest swelling measured 15 cm × 12 cm × 10 (1800cm^3), and the smallest was 6 cm × 5 cm × 4 cm (120cm^3) as they were measured in the final histopathology reports . Table 2 Out of 76 patients included in the study 52 patients had no comorbidity, 18 patients had hypertension and 12 had diabetes mellitus. Table 3 Most of the FNAC results were benign thyroid lesions which represent about 60.5 % of cases. Table 4 Benign lesions which presented in 76.2 % were the most common lesions while malignancy was presented in 23.66 % of patients. Table 5

FNAC results correlated with postoperative histopathology and revealed that out of 61 cases diagnosed as benign lesion on cytology, 58 were confirmed on histopathology, while 3 cases turned out to be follicular carcinoma. Similarly, cytohistological correlation of malignant lesions revealed that 15 cases which were reported as neoplastic on cytology, all are confirmed on histopathology. Thus are considered as true positives and hence the Sensitivity, Specificity and Accuracy was 83.33%, 100 %, 76.5 % respectively. Table 6.

Table 1: Age distribution among study participants

Age group	**Number of cases**		**Percent**
30-39	16		**21.05 %**
40-49	15		**19.73 %**
50-59	30		**39.47 %**
60-69	12		**15.78%**
70-79	3		**3.94 %**
Sex	**Number**		**%**
Male	**9**		**11.8 %**
Female	**67**		**88.2 %**
Mean age	**SD**	**Median**	**Range**
50.52	**11.41**	**52**	**48**

Table 2: Statistical analysis of lesion size in relation benign and malignant cases

	Mean	**S.Deviation**	**T test**	**P value**
True Positive	169.4 cm^3	± 61543.2	0.725	**0.238**
True Negative	**305.89 cm^3**	**± 3024041.79**		

Table 3: Comorbidity characteristics distribution among study participants

Comorbidity	**Number of cases**	**Percent**
Diabetes mellitus	**6**	**7.9 %**
hypertension	**12**	**15.8 %**
Both DM and HTN	**6**	**7.9 %**
No comorbidity	**52**	**68.4 %**

Table 4: Spectrum of lesions on FNAC

FNAC result	**Number of cases**	**Percent**
Benign lesion	**46**	**60.5 %**
Follicular lesion	**15**	**19.73 %**
Suspicious malignancy	**3**	**3.94 %**
Malignant lesion	**12**	**15.78 %**

Table 5: Spectrum of lesions on histopathology

Postoperative histopathology	**Number of cases**	**Percent**
Multinodular Goiter	**43**	**56.5 %**
Adenoma	**15**	**19.7 %**
Papillary carcinoma	**12**	**15.78 %**
Follicular carcinoma	**3**	**3.94 %**
Anaplastic carcinoma	**3**	**3.94 %**

Table 6: Cytodiagnosis and its correlation with histopathological diagnosis of various thyroid lesions

	Preoperative fine needle aspiration cytology			**Chi-**	**p-value square**
Postoperative histopathology	**Benign lesion**	**Follicular lesion**	**Malignant lesion**	**Suspicious malignancy**	**51.817** **0.00001**
BNG	46	12	-	-	
P.Carcinoma	-	-	9	3	
F.carcinoma	-	3	-	-	
A.carcinoma	-	-	**3**	-	

DISCUSSION

Thyroid lesions are of great significance because most are amenable to medical or surgical management. The differential diagnosis of thyroid lesions is essential as malignancy necessitates surgery while follow-up is required in case of benign lesions [7]. In the past few years there has been an increase in the number of thyroid Operations that are done [8]. Because of the probability of malignancy, some clinicians, especially those in the surgical subspecialties, recommend that all nodules should be removed considering the risks and cost to be paid for a malignancy. On the other hand, endocrinologists support the approach that FNAC should be performed as the first step of evaluation in order to avoid unnecessary surgery. Because thyroid nodularity is so common, it would be difficult to operate on every patient with a thyroid swelling, as the incidence of malignancy is relatively low compared with the total incidence of thyroid nodularity [9]. This study was done on 76 patients with thyroid lesions. The age of patients studied ranged from 30 to 78 years, with the mean age was 11.41 ± 50.5 years. There was similar pattern in a study done in Turkey by Muratli and his colleagues showing that the mean age was 51.24 years indicating similar distribution [10]. Most of the patients presented between 3rd and 5th decade which is in accordance to the study of Sharma and other international studies [11]. Out of 76 patients 9 (11.8%) were males and 67 (88.2%) were females (M: F, 1:7.5). A similar pattern was found in a study conducted in India by Likhar and his colleagues, which showed female preponderance, with 86.3% females and 13.7% males constituting a male to female ratio of 1:7, and this may related to the fact that thyroid disease more common in females than males [12]. Painless neck swelling was the main presenting symptom nearly in all patients. Similar studies conducted in India by Sharma and his colleagues showed that neck swelling was the most common symptom 99.5% and that is may be explained by the fact that the most common causes are benign like colloid goiter and multinodular goiter which are not painful and cause swelling that becoming obvious and attracting the patient to seek medical advice before causing pressure symptoms[7]. In this current study the largest swelling was 1800cm3, and the smallest was 120cm3, mean volume was 169.4 cm3 in positive cases and 305.89 cm3 in negative cases, T value was 0.725 indicating no significant association with FNAC results. In the present study majority of patients had no comorbidities, only 12 (15.8%) patients have hypertension, 6 (7.9%) have diabetes mellitus and 6 (7.9%) patients have both diabetes and hypertension. Family history in our experience was irrelevant in almost all cases, similar pattern was seen in a study done in India by Sachin and colleagues and this may explained by the fact that away from medullary carcinoma there is no strong genetic relationship associated with various types of thyroid swelling [13]. In this study we classify the FNAC specimens as benign lesion, follicular lesion (follicular lesion of undetermined significance, suspicious malignant lesion and malignant lesion. benign lesion was the most common lesion in preoperative FNAC in about 46 patient out of 76 (60.5%) 15 patient (19.73 %) had follicular lesion , while malignant and Suspicious malignant lesions represented 15.78% , 3.94% respectively. These finding are similar to results of study done by Muratli and his colleagues which revealed that benign lesions represented 59.5%, follicular lesion 8.7%, malignant lesion and suspicious malignant lesions 17.6 %, 2.8% respectively [10]. At the same time it is fairly different from the results of the study done in India by Likhar which showed higher rate of benign lesion about 94.4% while malignant lesions were only in 2.6%. This may partially related to the age of the patients included in their study , most of the patients in their study were within age group 21–30 years, in our study we had no patient less than 30 years old [12] . In this study Multinodular Goiter was the most common postoperative histopathological diagnoses in 43 case out of 76 (56.5 %), followed by adenoma 19.7 %, and hence allover benign lesion was 76.2%, but papillary carcinoma was present in 12 patients out of 76 (15.78%) followed by follicular and anaplastic carcinoma 3.94% for each one of them. this is support the results of Muratli and his colleagues where the colloid goiter was represent 39.7% and papillary carcinoma 26.2% [10]. Also other international studies demonstrate almost similar results, supporting the evidence that benign lesion being the most common thyroid lesion [12, 14]. The 76 patients were analyzed, correlating FNAC with postoperative histopatholgy. Positive FNAC were found in 15 patients, and confirmed by histopathology as True positive cases (12 papillary carcinoma and 3 anaplastic carcinoma), on other hand negative FNAC were found in 61 patients, out of which 58 patients confirmed by histopathology as True negative cases (28 Colloid Goiter, 15 Multinodular Goiter and 15 adenoma) while 3 cases turned out to be follicular carcinoma and considered as false negative. The false negative FNAC results may occur because of sampling error or misinterpretation of cytology and are of great concern because they indicate the potential to miss malignant lesion. This current study indicates the sensitivity, specificity, and accuracy of FNA to be 83.33%, 100%, and 76.5%, respectively. Positive

Predictive Value (PVP) was 100 % and Negative Predictive Value (NVP) was 95.08 %. This indicated that ability of FNA to detect malignancy in our study was quite high .These values correspond well to similar data published in recent years. In 2015, Sharma reviewed the results of 724 FNAC and correlated it with histopathology. Their data revealed a mean sensitivity and specificity of 89.5 % and 98 %, respectively [11].

Sharma [9], reviewed the results of 48 FNAs and reported a sensitivity and specificity of 87.5 % and 100%, respectively. **Patil in** [15] reported a sensitivity and specificity of 93.75% and 100%, respectively [9], [15]. These results suggest that there is significant correlation of FNAC and final histopathological diagnosis and we can depend on FNAC in differentiating thyroid lesions that require surgery from those which can be managed conservatively.

CONCLUSION

A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery. Unless adequate cellular thyroid elements are identified, it is best to categorize the smear as inadequate rather than negative. This practice will reduce the false negative rate and contribute to effectiveness of this diagnostic technique. Aspirates should be gained from different portions of the nodule, preferably peripheral areas, in an organized and consecutive manner. It is essential to ensure that an adequate number of follicular cells are present.

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